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AUTHOR(S):

TABATA, Yasunori; WIDJAJA, Elizabeth;
MULYANINGSIH, Tri; PARMAN, Ir.; WIRIADINATA,
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Structural Survey and Artificial Induction of Aloeswood*¹

Yasunori TABATA*², Elizabeth WIDJAJA*³, Tri MULYANINGSIH*⁴,
Ir. PARMAN*⁴, Harry WIRIADINATA*³, Y.I. MANDANG*⁵
and Takao ITOH*²

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Introduction

Aloeswood is the scented wood and material of incense, aroma oil, and medicine. In the body of some specific wood living in Middle Asia to South-east Asia, only resin deposited part is called aloeswood. It is called agaru in India, gaharu in Malaysia and Indonesia, and Jinkoh in Japan¹⁾. Gaharu and aloeswood is not equal on the meaning, but this point will be discussed later. Kyara (Japanese) which is yielded only the part of middle Vietnam (personal communication) is also one type of aloeswood, and this is the highest quality jinkoh.

There are two opinion on our research, one is the structural survey of aloeswood tissue to know how the resin deposit of aloeswood, and to know the standard feature of aloeswood. The second is establishment of artificial induction method of aloeswood. Two plantation sites were used for experiment, one was in Matarum on Lombok island and other was in Pekanbaru on Sumatra island. We have used a plantation of *Gyrinops versteeghii* in Matarum, and that of *Aquilaria* sp. in Pekanbaru, Sumatra. And a fungus (*Fusarium* sp.) was induced artificially to these stems.

Materials and methods

Structural survey of aloeswood

Aloeswood samples for structural survey were donated from incense company (Shoyeido incense Co., Ltd.). The surface of aloeswood (especially end grain) was visually observed, and classified into several groups by color variation and pattern of resin deposition. The resin deposition in tissue of aloeswood was anatomically observed by light microscope, and compared by the visual classification with naked eye.

Artificial induction of aloeswood

Five trees of *Gyrinops versteeghii* from Lombok island were used for experiment. These trees were planted in 1996, and DBH were 15–20 cm. Twelve trees of *Aquilaria* sp. from Pekanbaru in Sumatra island were used for experiment. These trees were planted in 1986, and DBH were 20–30 cm.

Five fungi (*Fusarium* sp.) were isolated from Aloeswood and named *Fusarium trifosforium*, *Fusarium* sp. 1, *Fusarium* sp. 2, *Fusarium* sp. 3, *Fusarium* sp. 4.

To inoculate the fungi in stems of *Gyrinops versteeghii* fand

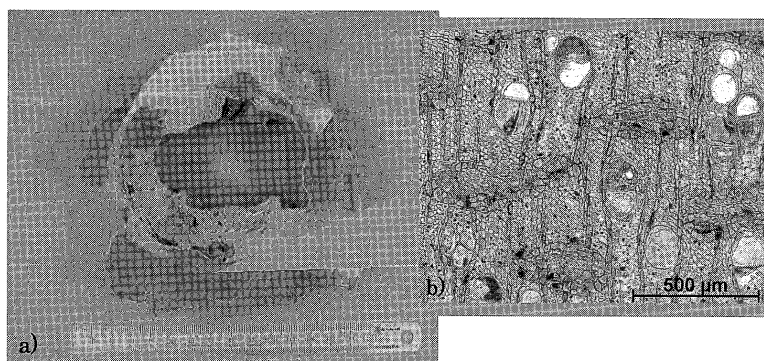


Fig. 1. Structure of aloeswood from Vietnam. a) End grain, b) Photograph of end grain by light microscopy: Brown resins deposited site was more often seen than yellow colored aloeswood. This tendency is notable on ray and included phloem.

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*² Laboratory of Cell Structure and Function, Wood Research Institute, Kyoto University, Uji, Kyoto, Japan.

*³ Research and Development Centre for Biology, Indonesian Institute of Sciences, Bogor, Indonesia.

*⁴ University of Matarum, Matarum, Lombok, Indonesia.

*⁵ Forest Products Research Institute, Bogor, Indonesia.

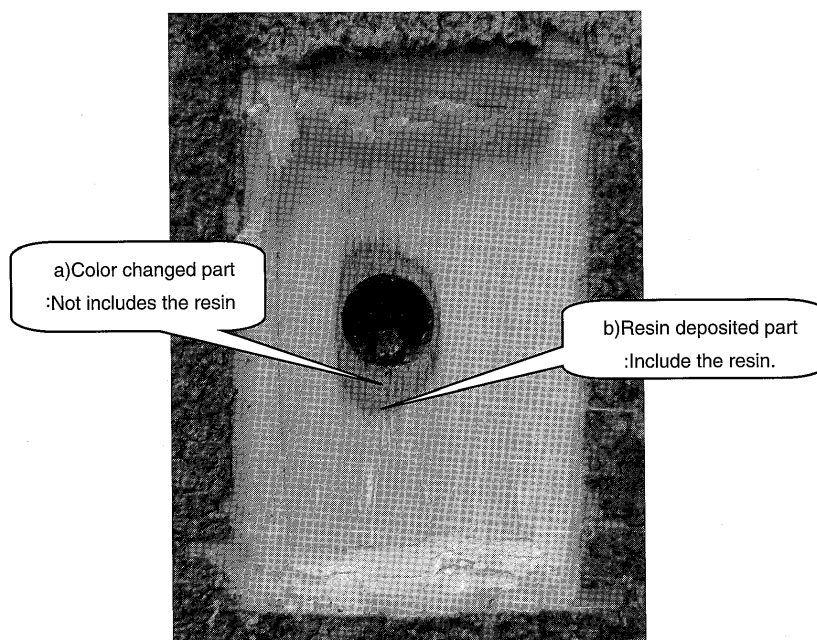


Fig. 2. Around the holes of a fungi-innoculated tree. a) Color changed site around the hole : there is many variations of color, light brown to dark brown. Sometimes this site be very elastic. b) Resin deposited site : Its color is also brown, but you can recognize by its tone.

Aquilaria sp., we used hand drills. Eight holes were opened for individual tree. four holes at breast height (120 cm above the ground) and four holes at 30 cm under the breast height. The depth of the holes were approximately 10 cm, and the width were 1 cm. After stuffing the fungi with culture medium, we plugged the hole by clay.

Results

Structural survey of aloeswood

There are many types of color and shape on aloeswood, but many aloeswood have some injured sites on it. And there are light colored sites and dark colored site on it. On light colored site, resins were recognized on included phloem and ray, suggesting the resin may be made in these tissues.

Artificial induction of aloeswood

Resin deposition occurs around the drilled site, above the term of treatment or differences of species of wood and fungi. Observed on flat grain, resin deposits site seemed like a oval surrounded the hole. Resin deposits several milimetres above from the hole on longitudinal direction, and contact with the hole on tangential direction (Fig. 2).

Discussion

Ramesh Rao and Dayal²⁾ said resin deposition is remarkable on included phloem, so the resin was made in included phloem and deposited to other tissues. But light colored part of aloeswood, resin deposits in included phloem and ray. And wood blocks around the fungi induced, had also resin on included phloem and ray. We think the resin may be made not only in included phloem but also in ray cells.

Resin deposition occurred not only in fungi-innoculated trees but also in control trees. Further, hyphae invaded in tissue of control, so it is difficult to conclude that the formation of aloeswood is induced by some fungi.

There were no differences on three terms of treatment (half year, one year, one and half year). We must try more shorter time span than half year.

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